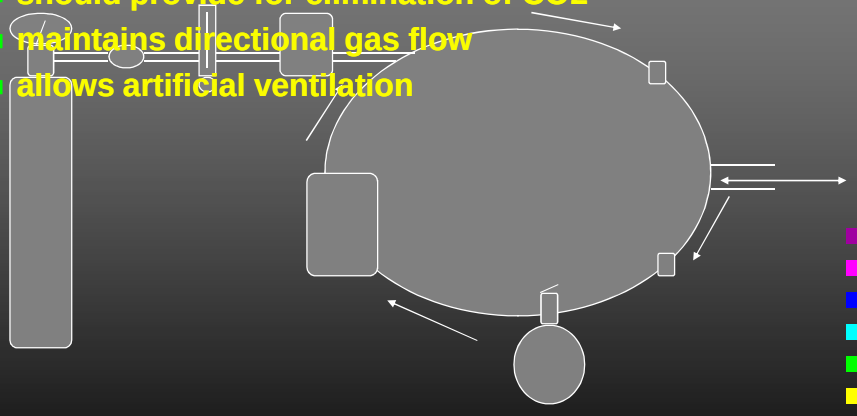
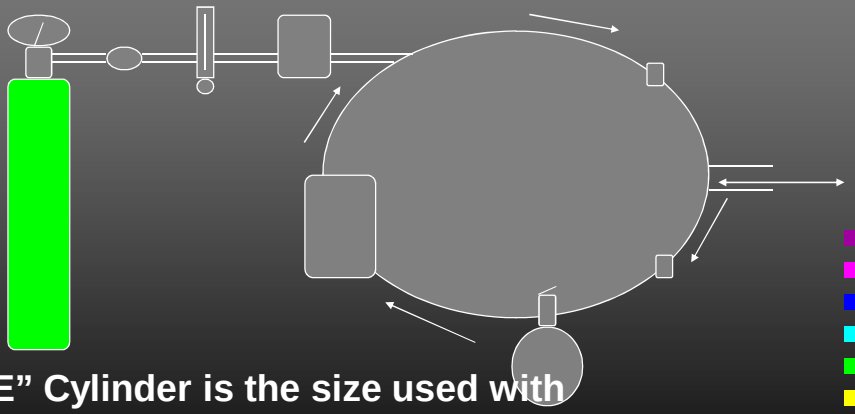
Anesthesia Machines and Systems

Circle Anesthesia Machine

- should provide for elimination of CO2
- maintains directional gas flow
- allows artificial ventilation



Oxygen cylinder



"E" Cylinder is the size used with anesthesia machines

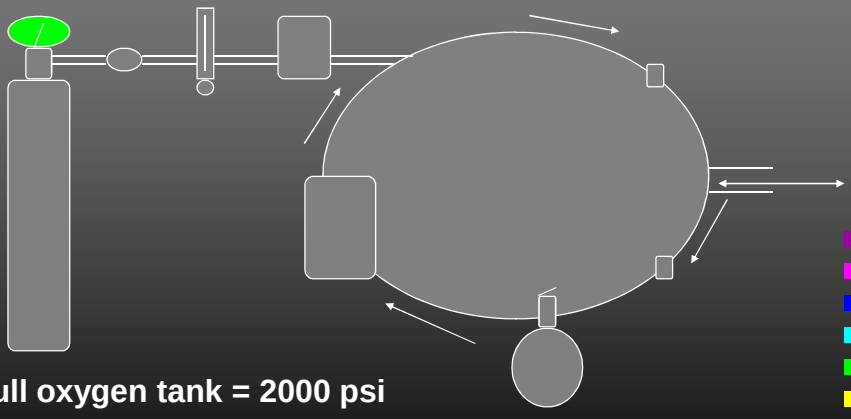
Compressed Gases (Oxygen)

- color coded
- 2000 psi (oxygen)
- 700 L. when full
- have pin index safety system
- "E" cylinder
- some gases support combustion (oxygen, nitrous oxide)

Nitrous Oxide

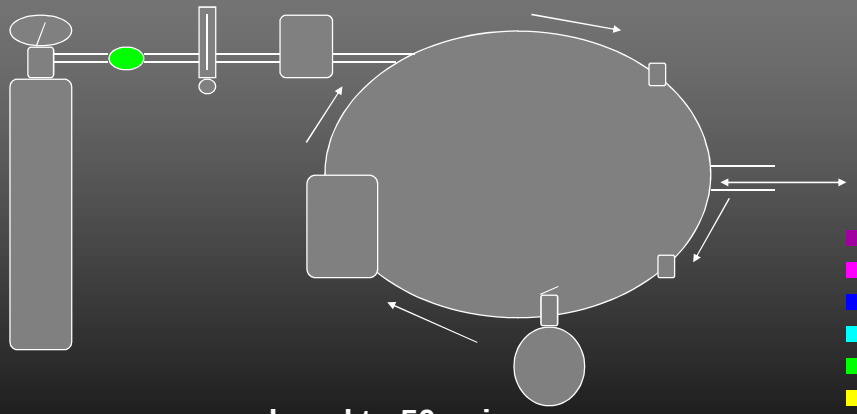
- compressed liquid
- 750 psi when liquid present
- analgesic
- relaxant
- more potent in humans
- used in 2-1 ratio with oxygen

Pressure gauge



Full oxygen tank = 2000 psi

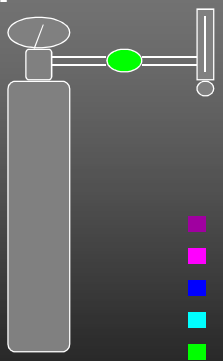
Pressure reduction valve



Oxygen pressure reduced to 50 psi

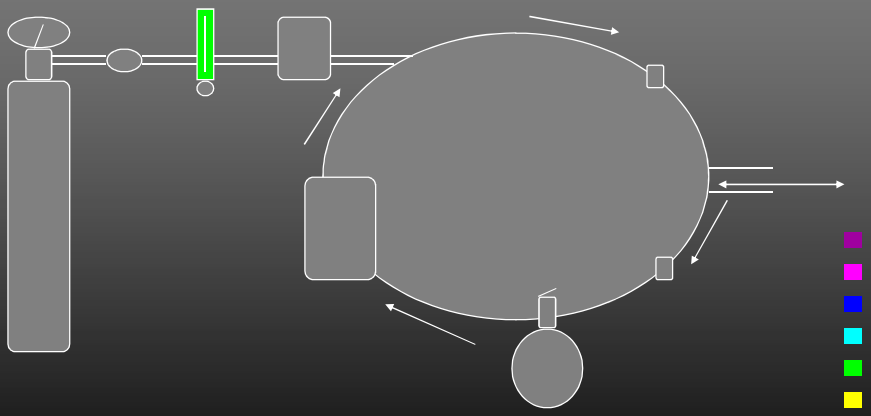
Gas Pressure Regulators - Pressure Reduction Valves

- reduces high pressure in cylinder to 50 psi
- central supply oxygen pressure already reduced



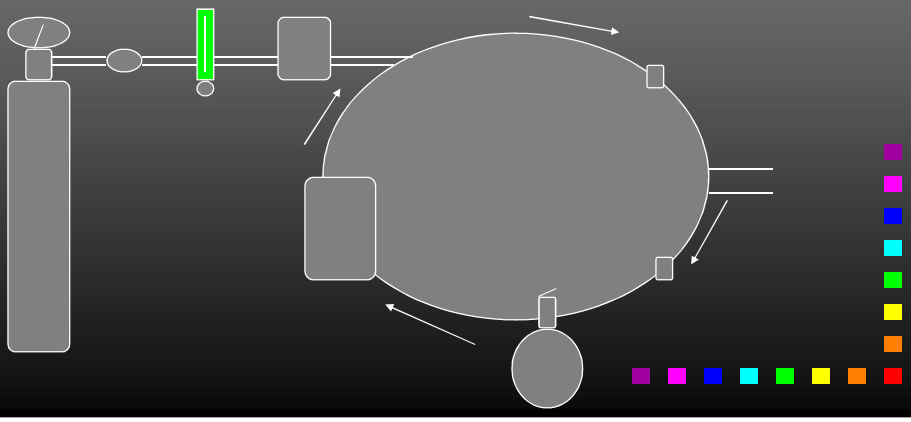
Oxygen flowmeter

Measured in liters per minute

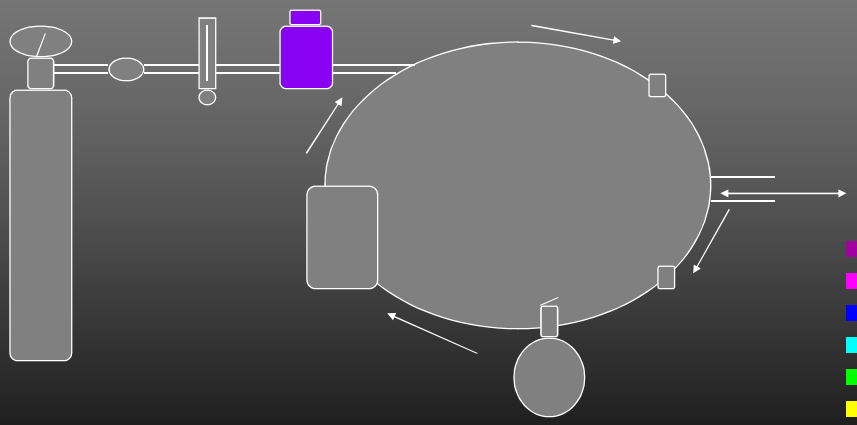


Flowmeter

- measures gas flow
- oxygen flows should meet or exceed metabolic requirement
- 2-3 ml/lb/min = metabolic requirement

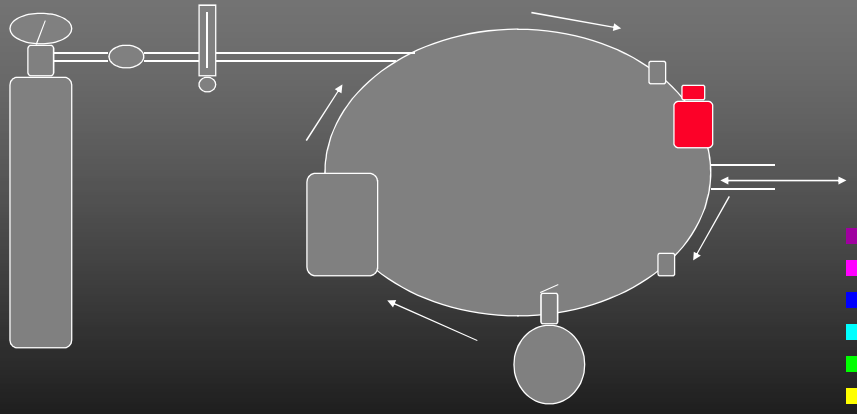


Vaporizer (out of the circle)



Used with halothane, isoflurane, and sevoflurane

Vaporizer (in the circle)



Used with methoxyflurane (currently not in US)

Factors affecting output of vaporizers

- Barometric pressure
- Temperature
- Carrier gas flow rate
- Back pressure

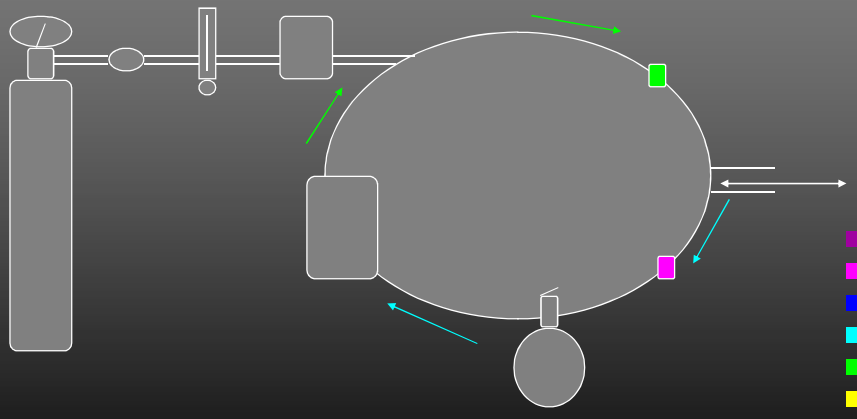
Classification of vaporizers

- Precision
  - "Tecs"
  - "Matics"
  - Vapor
  - Saturation
- Method of output regulation
  - Variable bypass
  - Measured flow

Classification of Vaporizers

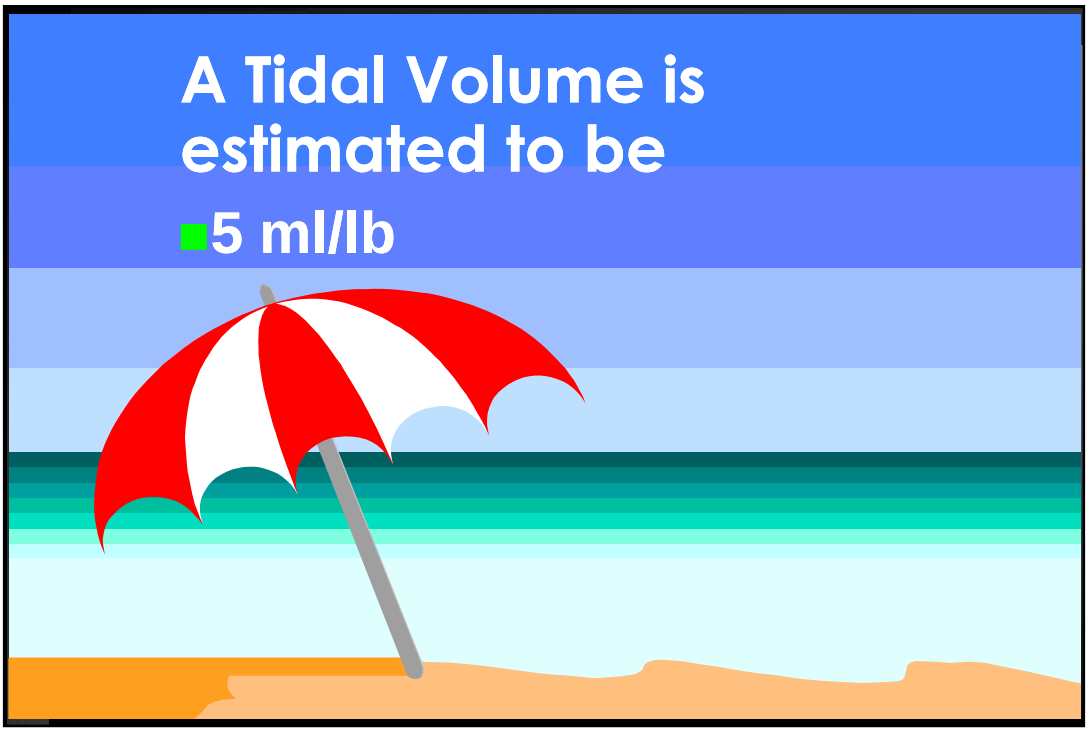
- Method of vaporization
- Location
- Temperature compensation

One way valves

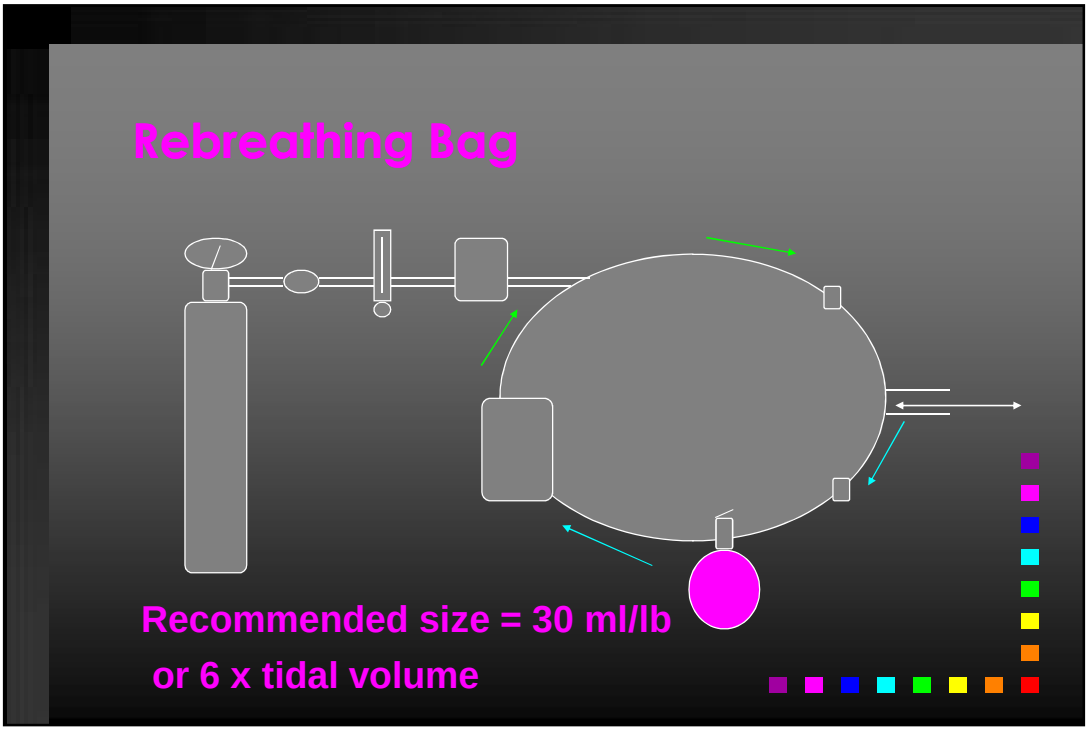


A Tidal Volume is estimated to be

- 5 ml/lb

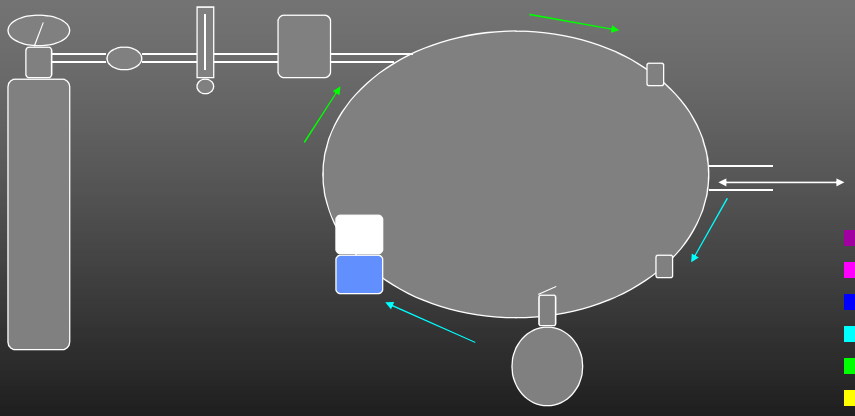


Rebreathing Bag



Recommended size = 30 ml/lb
or 6 x tidal volume

CO2 absorption Canister



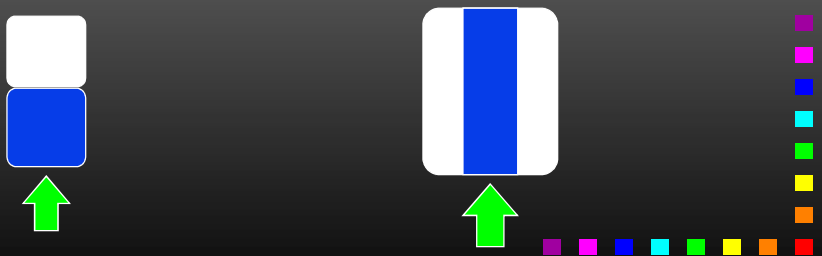
Recommended size = 2 X tidal volume

CO2 absorption

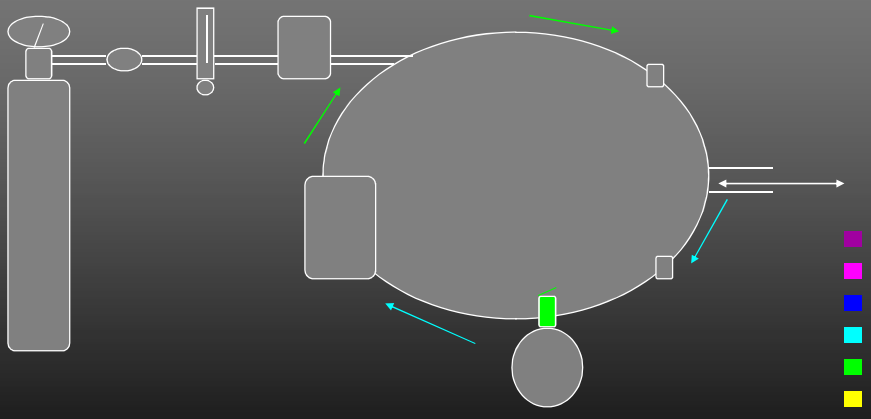
- two formulations - soda lime and baralyme
- sodalime
  - 94% calcium hydroxide, 5% sodium hydroxide and 1% potassium hydroxide
- baralyme
  - 80% calcium hydroxide and 20% barium hydroxide

CO2 absorption

- change absorbent after color changes 1/2 to 2/3
- change if granules are brittle
- “channeling” may be a problem



Pop off valve

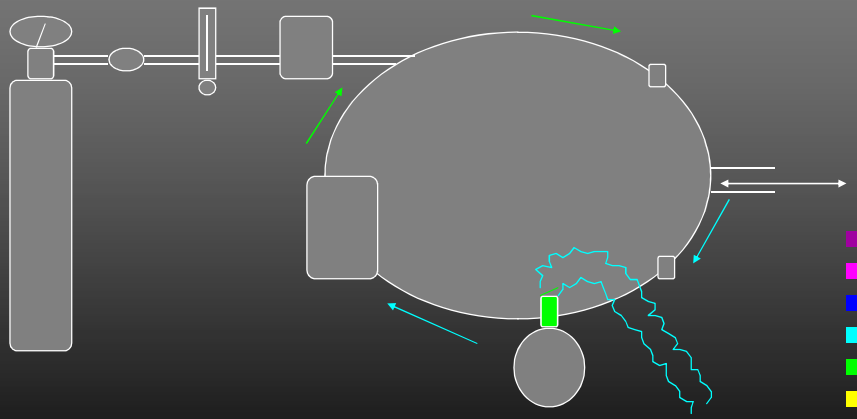


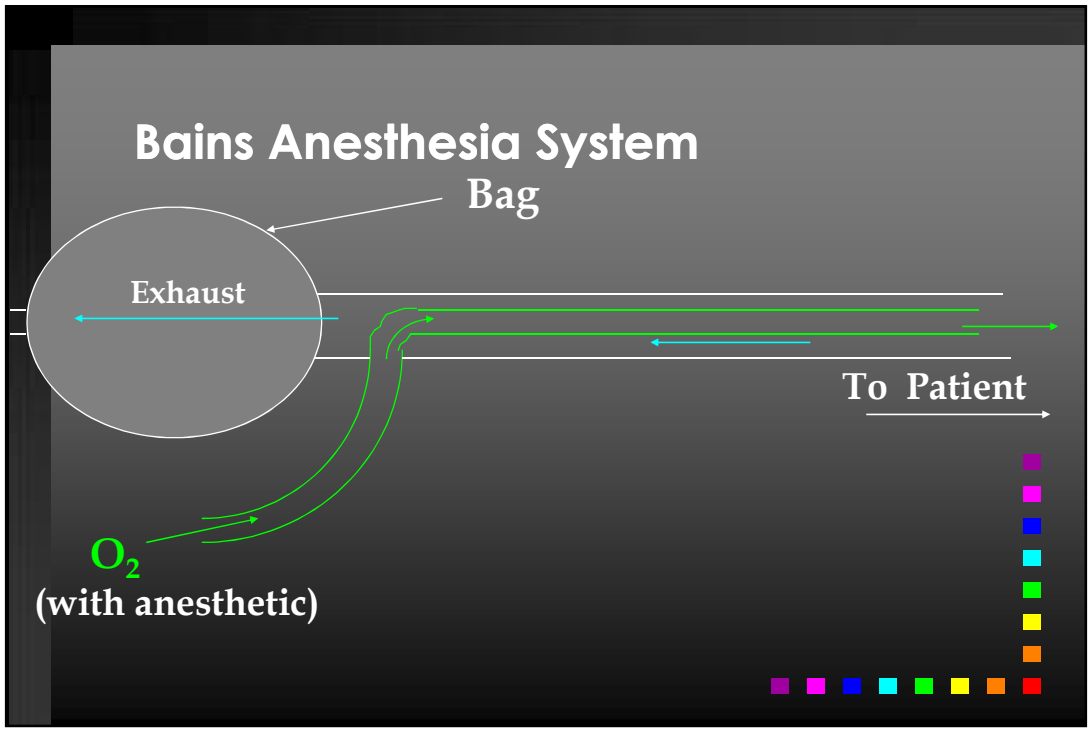
Usually in the “open” position

Pop Off Valve

- can be either open or closed in a "closed" system (O2 flow rate = 2-3 ml/lb/min)
- should be open in a "semi-closed" system
- should be either closed or partially closed if you are artificially breathing for the patient

Scavenger





Bains Anesthesia System

- use oxygen flow rate of 100 ml/lb/min
- used with small patients
- no dead space
- no resistance to breathing

Artificial Ventilation (IPPV)

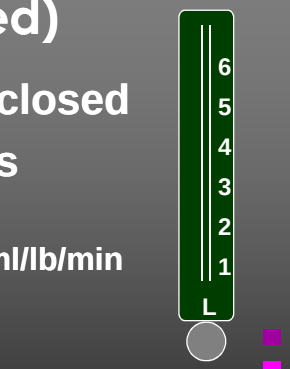
- ventilation rate = 8-20 breaths/minute
- tidal volume = 5-10 ml/lb
- inspiratory pressure = 10-30 cm/H20
- inspiratory time = 1 sec (2-3 sec in horses and cows)

Anesthesia Machines (Circle)

- Inceased resistance
- dead space
  - the rebreathing tubes are not part of the dead space
  - length of E-tube outside of mouth is considered dead space
- oxygen flow rate
  - greater than 2-3 ml/lb/min

Anesthesia Machine (Closed)

- pop-off may or may not be closed
- flow rate is what determines classification
  - closed system = flow rate of 2-3 ml/lb/min
- economical
- no pollution
- heat conservation



anesthesia machine “closed”

- requires closer monitoring
- difficult to reanesthetize a patient that wakes up
- N2O difficult to use
- buildup of toxic materials